VOLUME I
PERFORMANCE FLIGHT TESTING

APPENDIX A
SYMBOLS
TERMS AND ABBREVIATIONS

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SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
a	Acceleration	ft/sec^2
a	Lift curve slope	per deg or per rad
a	Speed of sound	ft/sec, mi/hr, kts
ac	Aerodynamic center	
A	Area	ft^2, m^2
AR	Aspect ratio	
b	Wingspan	ft, m
	Blade Width	ft, m
B	Number of blades	
BHP	Brake horsepower	
B.L.	Base line	
c	Absolute velocity	
c	Chord	ft, m
C	Compression	
C	Specific fuel consumption	lb/hr
^oC	Degrees centigrade	deg

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
C_r	Root chord	ft, m
C_t	Tip chord	ft, m
C_p	Specific heat at constant pressure	btu/lb ^{o}R
C_v	Specific heat at constant volume	btu/lb ^{o}R
C_d	Section drag coefficient	
C_f	Skin friction coefficient	
C_ℓ	Section lift coefficient	
C_m	Section moment coefficient	
C_F	Force coefficient	
C_D	Aircraft drag coefficient	
C_L	Aircraft lift coefficient	
$C_{L_{ic}}$	Indicated lift coefficient	
C_M	Aircraft moment coefficient	
C_p	Pressure coefficient	

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
C_P	Propeller power coefficient	
C_Q	Propeller torque coefficient	
C_T	Propeller thrust coefficient	
cg	Center of gravity	
cp	Center of pressure	
CR	Compression ratio	
CPR	Compressor Pressure ratio	
d	Differential	
D	Diameter	ft
D	Drag	lb
D	Diffuser	
d/dt	Time rate of change	
$dC_L/d\alpha$	Lift curve slope	per deg or per rad
e	Oswald's efficiency factor	
E	Shear modulus	

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
E	Endurance	hr
E	Total energy	ft lbs
E_m	Maneuver energy	ft lbs
E_s	Specific energy	ft
EGT	Exhaust gas temperature	deg
f	Function of	
f	Equivalent flat plate area	ft^2
F	Force	lb
F	Fan	
F	Resultant aerodynamic force	lb
^oF	Degrees Fahrenheit	deg
F_g	Gross thrust	lb
F_n	Net thrust	lb
F_{ex}	Excess thrust	lb
F.R.L	Fuselage reference line	

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
F.S.	Fuselage station	
g	Acceleration due to gravity	ft/sec^2
G	Gravitational constant	32.17405 ft^2/sec^2 geopotential ft
h	Enthalpy	btu/lb
h	Tapeline altitude	ft
h_v	Kinetic energy	
H	Total head pressure	lb/in^2
H	Combustor	
H	Altitude, general	ft
H	Geopotential at a point	geopotential ft
H_c	Pressure altitude	ft
H_i	Indicated altitude	ft

ARABIC Symbol or Term	Definition	Units
H_{ic}	Indicated altitude corrected for instrument error, $H_{ic} + \Delta H_{ic}$	ft
ΔH_{ic}	Altimeter instrument correction	ft
H_{ic_ℓ}	Indicated altitude corrected for instrument and lag errors, $H_i + \Delta H_{ic} + \Delta H_{ic_\ell}$	ft
ΔH_{ic_ℓ}	Altimeter lag correction	ft
ΔH_p	Altimeter position error corresponding to ΔP_p	ft
ΔH_{pc}	Altimeter position error correction	ft
HP	Horsepower	hp
H.V.	Heating value of hydrocarbon fuel	btu/lb
I_s	Specific impulse	sec
J	Propeller advance ratio	
K_n	A constant	
K_t	Temperature probe recovery factor	
^oK	Degrees Kelvin	deg

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
KE	Kinetic Energy	
ℓ	Characteristic length	ft
ln	Natural logarithm	
L	Lift	lb
L	Length, dimensional analysis	
L	Standard lapse rate -1.98 ^{o}C/1000 ft	deg/ft
m	Slope of a line at a point	
m	Mass	slug
mac	Mean aerodynamic chord	
M	Mass, dimensional analysis	
M	Mach, flight or free stream	
M_i	Indicated Mach	
M_{ic}	Indicated Mach corrected for instrument error, $M_i + \Delta M_{ic}$	
ΔM_{ic}	Machmeter instrument correction	
ΔM_p	Machmeter position error corresponding to P_p	

ARABIC Symbol or Term	Definition	Units
ΔM_{pc}	Machmeter position error correction	
M	Moment	ft lb
MAC	Mean aerodynamic chord	
n	Load factor	
n	Number of stages	
N	Nozzle	
N	Revolutions per minute	
NACA	National Advisory Committee for Aeronautics	
NASA	National Aeronautics and Space Administration	
N_{pr}	Prandtl number	
P	Power	hp, ft lb/sec
P	Pressure, general	lb/in^2
P	The applied pressure at a point at a time, t	in Hg
P_a	Atmospheric pressure corresponding to H_c	in Hg

ARABIC Symbol or Term	Definition	Units
$P_{a_{sl}}$	Atmospheric pressure at standard sea level	2116.22 lb/ft^2 29.92126 in Hg
P_i	The indicated pressure at a point at a time, t	in Hg
ΔP_p	Static pressure error or position error	in Hg
P_s	Pressure corresponding to H_{ic}	in Hg
P_s	Specific Excess power	
P_t or P_T	Free stream total pressure	in Hg, lb/in^2
P'_t	Total pressure at total pressure source	in Hg
PE	Potential energy	ft lb
q	Dynamic pressure, $\rho V_T^2/2$	in Hg
q_c	Differential pressure, $P'_t - P_a$	in Hg
q_{cic}	Differential pressure corresponding to V_{ic}, $P'_t - P_s$	in Hg
Q	Heat or heat energy	btu
Q	Torque	in lb

SYMBOLS, TERMS, AND ABBREVIATIONS

ARABIC Symbol or Term	Definition	Units
r	Blade length	in, ft
R	Radius of turn	
R	Range	
R	Gas constant for dry air	$ft^2/sec^2\ ^oR$
^oR	Degrees Rankine	deg
R_e	Radius of the earth	ft
R_e	Reynolds Number	
RF	Range factor	
ROC	Required operational capability	
ROC	Rate of climb	
RW	Relative wind	
s	Specific Entropy	btu/lb
s	Distance	ft
S	Total wing or planform area	ft^2
S_a	Air distance	ft

ARABIC Symbol or Term	Definition	Units
S_g	Ground roll distance	ft
SM	Stall margin	
SR	Specific range	nam
SFC	Specific fuel consumption	
SPR	Stage pressure ratio	
t	Thickness	in, ft
t	Time	sec
t_a	Atmospheric temperature	^oC
t_{as}	Standard day atmospheric temperature corresponding to H_c	^oC
$t_{a_{sl}}$	Standard sea level atmospheric temperature	15^oC
t_{at}	Test day atmospheric temperature	^oC
t_i	Indicated temperature	^oC
t_{ic}	Indicated temperature corrected for instrument error, $t_i + \Delta t_{ic}$	^oC
Δt_{ic}	Air temperature instrument correction	^oC

ARABIC Symbol or Term	Definition	Units
T	Temperature	deg
T	Time, dimensional analysis	
T	Turbine	
T	Propeller thrust	lb
T_a	Atmospheric temperature	^oK
T_{as}	Standard day atmospheric temperature corresponding to H_c	^oK
$T_{a_{sl}}$	Standard sea level atmospheric temperature	288.16^oK
T_{at}	Test day atmospheric temperature	^oK
T_i	Indicated temperature	^oK
T_{ic}	Indicated temperature corrected for instrument error, $T_i + \Delta T_{ic}$	^oK
ΔT_{ic}	Air temperature instrument correction	^oK
T_t	Total temperature	^oK
T_T	Total temperature (general)	deg

ARABIC Symbol or Term	Definition	Units
TE	Total energy	
THP	Thrust horsepower	
TIT	Turbine inlet temperature	deg
TPR	Total pressure ratio	
TSFC	Thrust specific fuel consumption	lb/hr
u	Linear velocity	ft/sec
V	Velocity or true airspeed	
V_c	Calibrated airspeed, $V_i + \Delta V_{ic} + \Delta V_{pc}$	kts
V_e	Equivalent airspeed, $V_c + \Delta V_c$ or $V\sqrt{\sigma}$	kts
V_i	Indicated airspeed	kts
V_{ic}	Indicated airspeed corrected for instrument error, $V_i + \Delta V_{ic}$	kts
ΔV_{ic}	Airspeed indicator instrument correction	kts
V_{ic_ℓ}	Indicated airspeed corrected for instrument and lag errors,	
	$V_i + \Delta V_{ic} + \Delta V_{ic}$	kts

ARABIC Symbol or Term	Definition	Units
ΔV_{ic_ℓ}	Airspeed indicator lag corrections	kts
ΔV_p	Airspeed indicator position error corresponding to ΔP_p	kts
ΔV_{pc}	Airspeed indicator position error correction	kts
ΔV_c	Compressibility correction	kts
V_s	Standard day true airspeed	kts
V_t	Test day true airspeed	kts
w	Relative velocity	ft/sec
w or W	Work	ft/lb
w	Downwash velocity	ft/sec
W	Aircraft gross weight	lb
$\dot{w}_a$	Airflow rate	lb/hr or lb/sec
$\dot{w}_f$	Fuel flow rate	lb/hr or lb/sec
W.L.	Water line	
X	Distance	ft
z	Energy reference height	ft
$\propto$	Proportional to	

Symbol or Term	Definition	Units
α	Angle of attack	deg, rad
β	Angle of sideslip	deg
β	Bypass ratio	
γ	Ratio of specific heats	
γ	Flight path angle	deg
δ	Pressure ratio , $P_a/P_{a_{sl}}$	
δ_{ic}	$P_s/P_{a_{sl}}$	
δ_L	Laminar boundary layer thickness	
δ_T	Turbulent boundary layer thickness	
δ	Wedge angle or turning angle	
Δ	Change in any quantity	
ε	Axial strain	
ε	Downwash angle	deg, rad
η	Efficiency	
η_o	Overall efficiency	
η_p	Propulsive efficiency	

Symbol or Term	Definition	Units
η_{th}	Thermal efficiency	
θ	Temperature ratio, $T_a/T_{a_{sl}}$	
θ_s	$T_{as}/T_{a_{sl}}$	
θ_t	$T_{at}/T_{a_{sl}}$	
θ	Shock wave angle	
λ	Lag constant	sec
$\lambda_{H_{ic}}$	Lag constant corresponding to H_{ic}	sec
λ_s	Static pressure lag constant	sec
λ_{sl}	Lag constant at standard sea level	sec
$\lambda_{s_{sl}}$	Static pressure lag constant at standard sea level	sec
λ_t	Total pressure lag constant	sec
$\lambda_{t_{sl}}$	Total pressure lag constant at standard sea level	sec
λ	Taper ratio	
λ	Sweep angle	deg

SYMBOLS, TERMS, AND ABBREVIATIONS

Symbol or Term	Definition	Units
μ	Coefficient of absolute viscosity	lb sec/ft^2
μ	Viscosity at temperature T_a	lb sec/ft^2
$\mu_{H_{ic}}$	Viscosity corresponding to H_{ic}	lb sec/ft^2
μ_{sl}	Viscosity at standard sea level	3.7452×10^{-7} lb sec/ft^2
μ	Mach angle	deg
μ	Coefficient of friction	
ν	Kinematic viscosity	ft sec
ν	Turning angle	deg
π	3.14159 ...	
π	Buckingham π	
ρ	Air density	slug/ft^3
ρ_a	Standard day air density corresponding to H_c	slug/ft^3
ρ_{sl}	Air density at standard sea level	.0023769 slug/ft^3
ρ_t	Test day air density	slug/ft^3
σ	Density ratio, ρ_a/ρ_{sl}	
σ_s	ρ_s/ρ_{sl}	

Symbol or Term	Definition	Units
σ_t	ρ_t/ρ_{sl}	
σ	Axial stress	lb/in^2
σ	Solidity ratio	
τ	Acoustic lag	sec
τ	Shear stress	lb/in^2
ϕ	Bank angle	deg
ω	Rate of turn	deg/sec or rad/sec

SUBSCRIPTS

Symbol or Term	Definition
a	Ambient
a	Available
cr	Critical
e	Equivalent
ex	Excess
f	Final
i	Induced
i	Initial
iw	Corrected to a standard weight
L	Laminar
M	Wave
N	Normal (perpendicular)
o	Stagnation or total
p	Parasite

SUBSCRIPTS

Symbol or Term	Definition
p	Pressure
r	Required
r	Root
s	Static
s	Standard day
sl	Sea level
t	Tangential
t	Test day
T	Total
TD	Touchdown
TO	Takeoff
X	Conditions upstream of shock wave
Y	Conditions downstream of shock wave
OL	Zero lift
1,2,3, etc.	Specific condition or station

SUBSCRIPTS

Symbol or Term	Definition
∞	Free stream condition

SUPERSCRIPT

Symbol or Term	Definition
	Choked condition